Deutsches Institut für Bautechnik
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Bautechnisches Prüfamt
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-12/0258

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	fischer Superbond *fischer Superbond*
Zulassungsinhaber *Holder of approval*	fischerwerke GmbH & Co. KG Otto-Hahn-Straße 15 79211 Denzlingen DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Verbundanker in den Größen M8 bis M30 zur Verankerung im Beton *Bonded Anchor of sizes M8 to M30 for use in concrete*
Geltungsdauer: *Validity:* vom *from*	26 June 2013
bis *to*	8 August 2017
Herstellwerk *Manufacturing plant*	fischerwerke

Diese Zulassung umfasst *This Approval contains*	37 Seiten einschließlich 27 Anhänge *37 pages including 27 annexes*
Diese Zulassung ersetzt *This Approval replaces*	ETA-12/0258 mit Geltungsdauer vom 08.08.2012 bis 08.08.2017 *ETA-12/0258 with validity from 08.08.2012 to 08.08.2017*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];

Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4]*, as amended by Article 2 of the law of 8 November 2011*[5]*;*

Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];

Guideline for European technical approval of "Metal anchors for use in concrete - Part 5: Bonded anchors", ETAG 001-05.

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

[1] Official Journal of the European Communities L 40, 11 February 1989, p. 12
[2] Official Journal of the European Communities L 220, 30 August 1993, p. 1
[3] Official Journal of the European Union L 284, 31 October 2003, p. 25
[4] *Bundesgesetzblatt Teil I 1998*, p. 812
[5] *Bundesgesetzblatt Teil I 2011*, p. 2178
[6] Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The fischer Superbond is a bonded anchor consisting of a cartridge with injection mortar FIS SB, FIS SB Low Speed or FIS SB High Speed or a mortar capsule fischer RSB and a steel element. The steel elements are either

- fischer anchor rods FIS A in the range of M8 to M30 or
- fischer threaded rod RGM in the range of M8 to M30 or
- fischer internal threaded anchor RG MI in the range of M8 to M20 or
- Reinforcing bar in the range of Ø 8 to Ø 32 or
- fischer rebar anchor FRA in the range of 12 to 24.

In case of the injection system the anchor rod is placed into a drilled hole filled with injection mortar.

The mortar capsule is placed in the hole and the threaded rod or the internal threaded anchor is driven by machine with simultaneous hammering and turning.

The steel elements are anchored via the bond between steel element, injection mortar and concrete.

An illustration of the product and intended use is given in Annexes 1 to 4.

1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences. Safety in case of fire (Essential Requirement 2) is not covered in this European technical approval. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206:2000-12.

The anchor may be installed in cracked or non-cracked concrete.

The capsule system may be used in dry or wet concrete or in flooded holes excepting sea water. The injection system may be used in dry or wet concrete; it must not be installed in flooded holes.

The anchor with steel elements given in Annex 4 may also be used under seismic action for performance category C1 according to Annexes 25 to 27.

The anchor may be used in the following temperature ranges:

Temperature range I:	-40 °C to +40 °C	(max short term temperature +40 °C and max long term temperature +24 °C)
Temperature range II:	-40 °C to +80 °C	(max short term temperature +80 °C and max long term temperature +50 °C)
Temperature range III:	-40 °C to +120 °C	(max short term temperature +120 °C and max long term temperature +72 °C)

Temperature range IV: -40 °C to +150 °C (max short term temperature +150 °C and max long term temperature +90 °C)

Elements made of zinc plated or hot-dip galvanised steel:

The steel elements made of zinc plated or hot-dip galvanised steel may only be used in structures subject to dry internal conditions.

Elements made of stainless steel A4:

The steel elements made of stainless steel may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such particular aggressive conditions are e. g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e. g. in desulphurization plants or road tunnels where de-icing materials are used).

Elements made of high corrosion resistant steel C:

The steel elements made of high corrosion resistant steel may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such particular aggressive conditions are e. g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e. g. in desulphurization plants or road tunnels where de-icing materials are used).

Elements made of reinforcing bars:

Post-installed reinforcing bars may be used as anchor designed in accordance with the EOTA Technical Reports TR 029 and TR 045 only. Such applications are e.g. concrete overlay or shear dowel connections or the connections of a wall predominantly loaded by shear and compression forces with the foundation, where the reinforcing bars act as dowels to take up shear forces. Connections with post-installed reinforcing bars in concrete structures designed in accordance with EN1992-1-1: 2004 are not covered by this European technical approval.

The provisions made in this European technical approval are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

The anchor corresponds to the drawings and provisions given in the Annexes. The values, dimensions and tolerances of the anchor not indicated in the Annexes shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

The characteristic anchor values for the design of anchorages are given in the Annexes.

The two components of the injection mortar fischer FIS SB, FIS SB High Speed and SB Low Speed are delivered in unmixed condition in side-by side-cartridges of sizes 390 ml, 585 ml, 1100 ml or 1500 ml or in resin capsules RSB according to Annex 1.

[7] The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

Each mortar cartridge and each mortar capsule RSB and each steel element is marked in accordance with the Annexes.

Elements made of reinforcing bars shall comply with the specifications given in Annex 9.

The marking of embedment depth may be done on jobsite.

2.2 Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Part 1 "Anchors in general" and Part 5 "Bonded anchors" on the basis of Option 1 and ETAG 001 Annex E "Assessment of Metal Anchors under Seismic Action".

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 96/582/EG of the European Commission[8] the system 2(i) (referred to as system 1) of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(a) Tasks for the manufacturer:

- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed control plan;

(b) Tasks for the approved body:

- (3) initial type-testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

[8] Official Journal of the European Communities L 254 of 08.10.1996.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan relating to this European technical approval which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.[9]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.3. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control

in accordance with the provisions laid down in the control plan relating to this European technical approval.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

[9] The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-1 Option 1, in addition: seismic performance category C1 – where applicable),
- size.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

4.2 Design of anchorages

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the EOTA Technical Report TR 029 "Design of bonded anchors"[10] and EOTA Technical Report TR 045 "Design of Metal Anchors under Seismic Action" under the responsibility of an engineer experienced in anchorages and concrete work.

Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastenings in stand-off installation or with a grout layer under seismic action are not covered by this European technical approval.

10 The Technical Report TR 029 "Design of Bonded Anchors" is published in English on EOTA website www.eota.eu.

Post-installed reinforcing bars may be used as anchor designed in accordance with the EOTA Technical Report TR 029 and TR 045 only. The basic assumptions for the design according to anchor theory shall be observed. This includes the consideration of tension and shear loads and the corresponding failure modes as well as the assumption that the base material (concrete structural element) remains essentially in the serviceability limit state (either non-cracked or cracked) when the connection is loaded to failure. Such applications are e.g. concrete overlay or shear dowel connections or the connections of a wall predominantly loaded by shear and compression forces with the foundation, where the reinforcing bars act as dowels to take up shear forces. Connections with reinforcing bars in concrete structures designed in accordance with EN 1992-1-1:2004 (e.g. connection of a wall loaded with tension forces in one layer of the reinforcement with the foundation) are not covered by this European technical approval.

Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.

For the fischer internal threaded anchor RG MI fastening screws or threaded rods made of appropriate steel and strength class acc. to Annex 8 shall be specified. The minimum and maximum thread engagement length l_E of the fastening screw or the threaded rod for installation of the fixture shall be met the requirements according to Annex 6, Table 3. The length of the fastening screw or the threaded rod shall be determined depending on thickness of fixture, admissible tolerances, available thread length and minimum and maximum thread engagement length l_E.

The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

4.3 Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site,
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor,
- anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European technical approval,
- For use of the injection mortar fischer FIS SB, fischer FIS SB High Speed and fischer FIS SB Low speed commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
    - material, dimensions and mechanical properties of the metal parts according to the specifications given in Annex 8, Table 7,
    - confirmation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents should be stored,
    - marking of the threaded rod with the envisage embedment depth. This may be done by the manufacturer of the rod or the person on jobsite.
- fischer resin capsules RSB may only be used with corresponding fischer threaded rods RGM,
- reinforcing bars shall comply with specifications given in Annex 9,
- checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply,
- check of concrete being well compacted, e.g. without significant voids,

- marking and keeping the effective anchorage depth,
- edge distance and spacing not less than the specified values without minus tolerances,
- positioning of the drill holes without damaging the reinforcement,
- drill holes for the cartridge injection system must be made by hammer drilling only,
- drill holes for the capsule system by hammer drilling or diamond drilling,
- in case of aborted hole: The hole shall be filled with mortar,
- the cartridge injection system must not be installed in flooded holes,
- cleaning the drill hole and installation in accordance with Annexes 11 to 14,
- if the anchor is proper installed mortar must be visible at the member surface.
- the anchor component installation temperature shall be at least 0 °C when using the injection system FIS SB and -15 °C when using the capsule system RSB,
- during curing of the mortar the temperature of the concrete must not fall below 0°C for the injection mortar FIS SB Low Speed,
- during curing of the mortar the temperature of the concrete must not fall below -15 °C for the injection mortar FIS SB,
- during curing of the mortar the temperature of the concrete must not fall below -20 °C for the injection mortar FIS SB High Speed,
- during curing of the mortar the temperature of the concrete must not fall below -30 °C for the capsule system RSB,
- the curing time until the anchor may be loaded as given in Annex 3, Table 1 has to be observed,
- installation torque moments are not required for functioning of the anchor. However, the torque moments given in the Annexes must not be exceeded.

5 Indications to the manufacturer

5.1 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to section 1 and 2 including Annexes referred to as well as sections 4.2, 4.3 and 5.2 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

- diameter of drill bit,
- hole depth,
- diameter of anchor rod,
- minimum effective anchorage depth,
- maximum thickness of the fixture,
- information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- temperature of anchor components while installation,
- ambient temperature of the concrete during installation of the anchor,
- admissible processing time (open time) of a cartridge,

- curing time until the anchor may be loaded as a function of the ambient temperature in the concrete during installation,
- installation torque moment,
- identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

5.2 Packaging, transport and storage

The mortar cartridges and the capsules shall be protected against sun radiation and shall be stored according to the manufacturer instructions in dry condition at temperatures of at least +5 °C to not more than +25 °C (Short time storage up to +35 °C is admissible).

Mortar cartridges and glass capsules with expired shelf life must no longer be used.

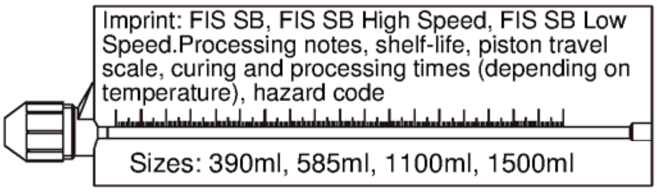
The anchor shall only be packaged and supplied as a complete unit. Mortar cartridges and capsules may be packed separately from metal parts.

The manufacturer's installation instruction shall indicate that the mortar cartridges and capsules can be used only with the corresponding steel elements.

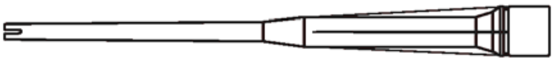
Uwe Bender
Head of Department

beglaubigt:
Lange

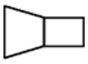
Injection system FIS SB



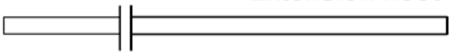
Static mixer



Injection-adapter



Extension hose

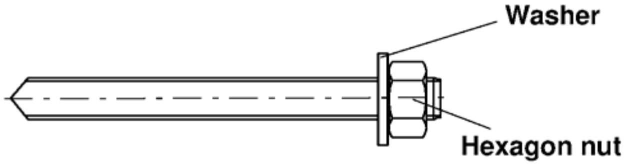


Resin capsule system RSB

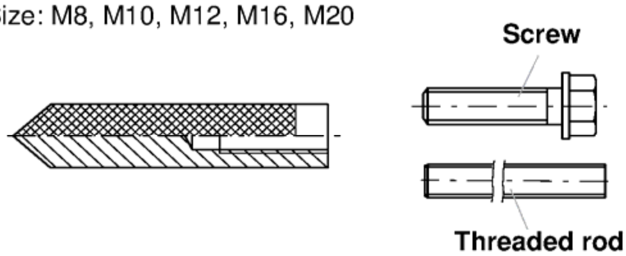
Resin capsule RSB

fischer threaded rod FIS A or RGM
Size: M8, M10, M12, M16, M20, M24, M27,M30

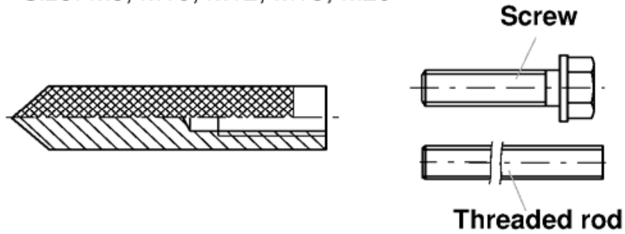
fischer threaded rod RGM
Size: M8, M10, M12, M16, M20, M24, M30



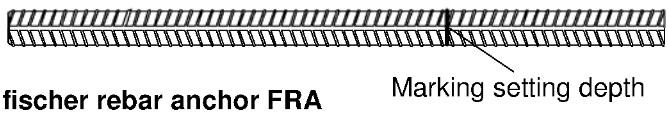
fischer internal threaded anchor RG MI
Size: M8, M10, M12, M16, M20



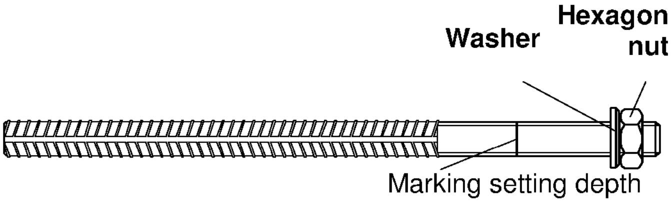
fischer internal threaded anchor RG MI
Size: M8, M10, M12, M16, M20



Reinforcing bar
Size: Ø8, Ø10, Ø12, Ø14, Ø16, Ø20, Ø25, Ø28, Ø32

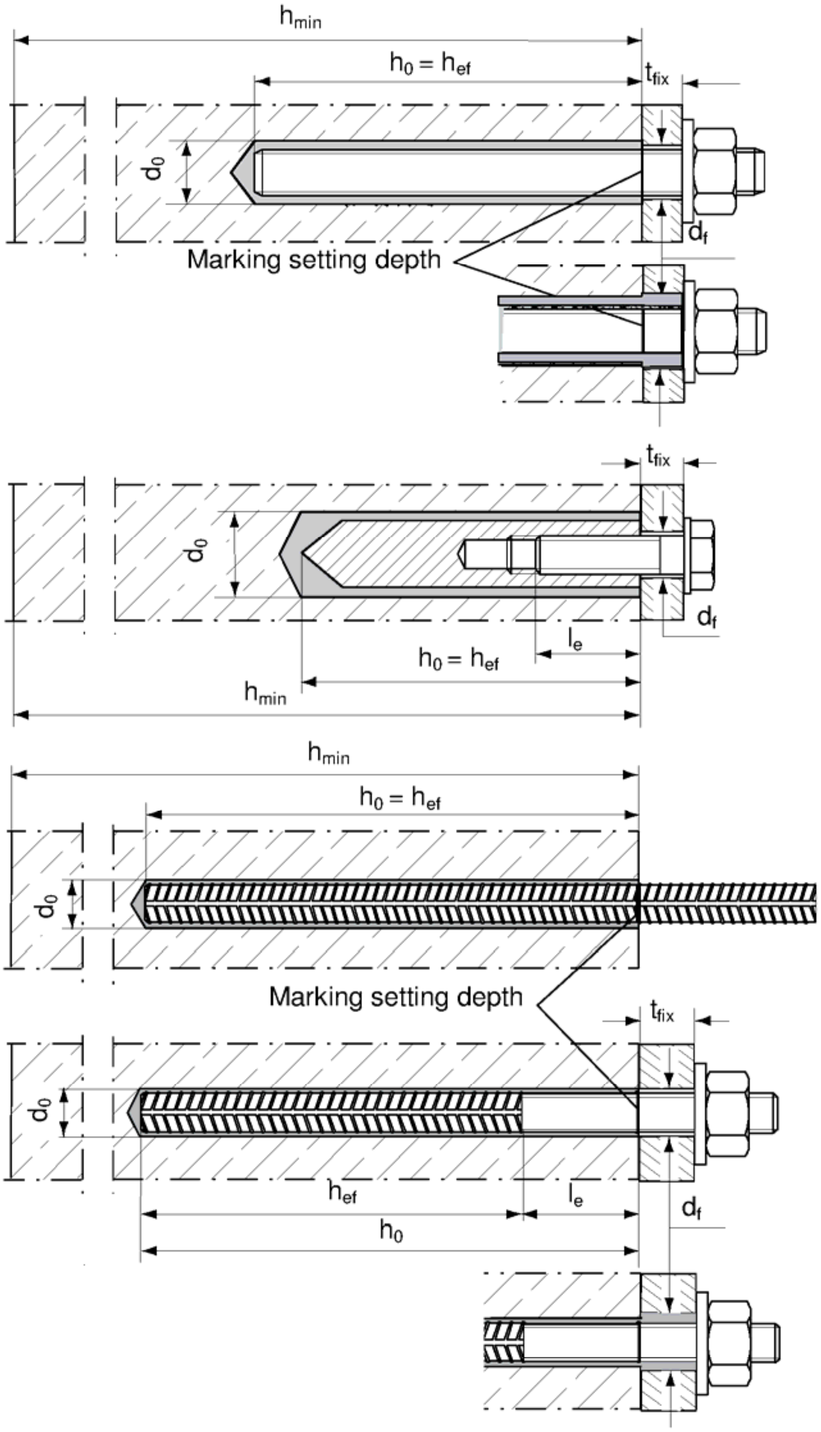


fischer rebar anchor FRA
Size: 12, 16, 20, 24



fischer Superbond	Annex 1
Product	

Deutsches Institut für Bautechnik DIBt



fischer threaded rod FIS A or RGM
Pre-positioned anchorage

Push through anchorage
(annual clearance filled with mortar)

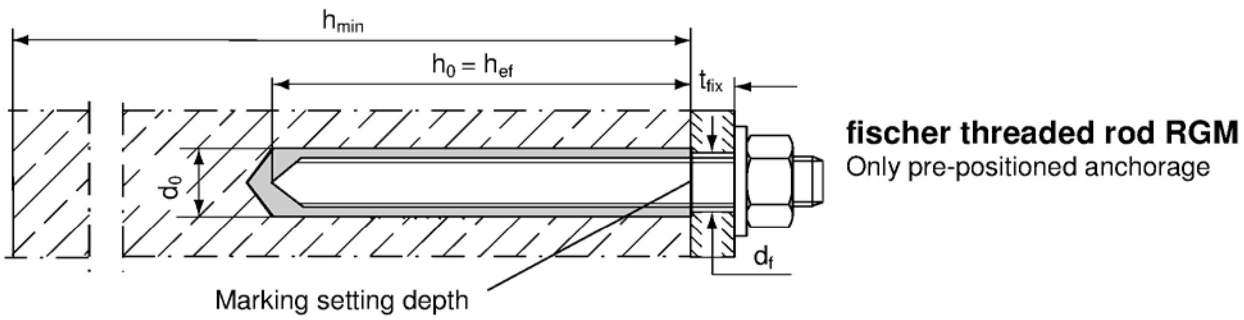
fischer internal threaded anchor RG MI
Only pre-positioned anchorage

Reinforcing bar

fischer rebar anchor FRA
Pre-positioned anchorage

Push through anchorage (annual clearance filled with mortar)

fischer Superbond	**Annex 2**
Injection mortar system FIS SB Application range	



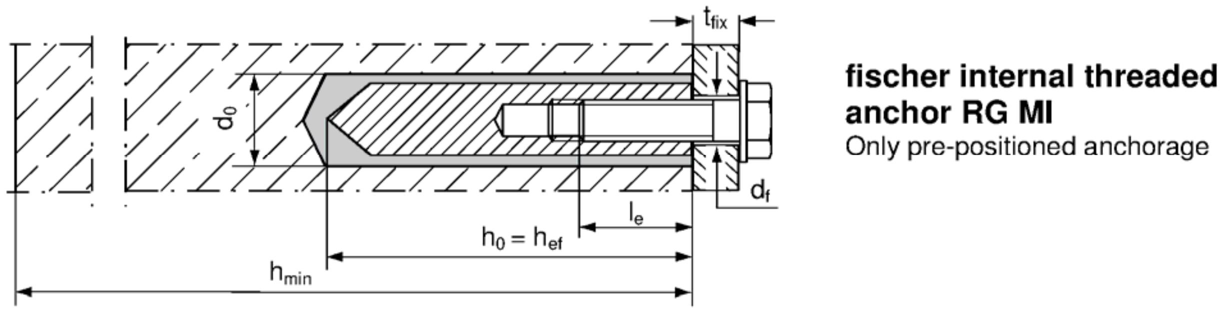


Table 1: Maximum permissible processing times and minimum curing times
(minimum cartridge temperature 0°C; minimum capsule temperature -15°C)

Temperature in the anchorage base [°C]	Maximum processing time t_{work} [minutes]			Minimum curing time t_{cure} [minutes]			
	FIS SB Low Speed	**FIS SB**	**FIS SB High Speed**	**FIS SB Low Speed**	**FIS SB**	**FIS SB High Speed**	**RSB**
-30 to -20	---	-----	—	---	---	---	120 hours
>-20 to -15	---	-----	60	---	---	24 hours	48 hours
>-15 to -10	---	60	30	---	36 hours	8 hours	30 hours
>-10 to -5	---	30	15	---	24 hours	3 hours	16 hours
>-5 to ±0	---	20	10	---	8 hours	2 hours	10 hours
>±0 to +5	30	13	5	17 hours	4 hours	1 hour	45
>+5 to +10	15	9	3	8 hours	120	45	30
>+10 to +20	12	5	2	4,5 hours	60	30	20
>+20 to +30	8	4	1	60	45	15	5
>+30 to +40	5	2	---	60	30	---	3

fischer Superbond	**Annex 3**
Resin capsule system RSB Application range Processing times, curing times FIS SB and RSB	

Intended use	Injection system FIS SB / High Speed / Low Speed	Resin Capsule system RSB
Installation in cracked or uncracked concrete	Permitted for all anchor and sizes	Permitted for RGM and RG MI all sizes
Installation in in dry or wet concrete	Permitted for all anchor and sizes	Permitted for RGM and RG MI all sizes
Installation in flooded holes	Not permitted	Permitted for RGM and RG MI all sizes
Installation in diamond drilled holes; uncracked concrete	Not permitted	Permitted for RGM and RG MI all sizes
Installation in diamond drilled holes; cracked concrete	Not permitted	Permitted for RGM and RG MI drill holes ≥ 18mm
Design methods		
Static and quasi-static action		
Design according to ETAG 001, TR 029	Permitted for all anchor and sizes	Permitted for RGM and RG MI all sizes
Seismic action / Performence category C1 – Hammer drilled holes only		
Design according to ETAG 001, TR 045	Permitted for FIS SB with: - Threaded rods FIS A all sizes - Threaded rods RGM all sizes - Reinforcing bars B500B all sizes - Commercial standard threaded rods all sizes	Permitted for RGM all sizes

Temperature range

	max. long term temperature	max. short term temperature
Temperature range I: -40°C to +40°C	+24°C	+40°C
Temperature range II: -40°C to +80°C	+50°C	+80°C
Temperature range III: -40°C to +120°C	+72°C	+120°C
Temperature range IV: -40°C to +150°C	+90°C	+150°C

fischer Superbond

Intended use, design methods and temperature range

Annex 4

Deutsches Institut für Bautechnik DIBt

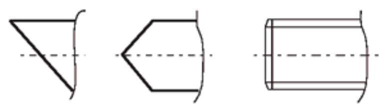
Table 2: Installation parameters for fischer threaded rods FIS A and RGM

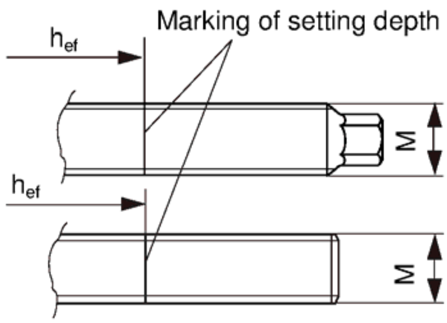
Size					**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Injection mortar FIS SB	Nominal drill bit diameter		d_0	[mm]	10	12	14	18	24	28	30	35
	Depth of drill hole		h_0	[mm]	$h_0 = h_{ef}$							
	Effective anchorage depth		$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
			$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600
	Diameter of clearance hole in the fixture[1)]	pre-positioned	$\le d_f$	[mm]	9	12	14	18	22	26	30	33
		push through	$\le d_f$	[mm]	11	14	16	20	26	30	33	40
Resin capsule RSB	Nominal drill bit diameter		d_0	[mm]	10	12	14	18	25	28	---	35
	Depth of drill hole		h_0	[mm]	$h_0 = h_{ef}$							
	Effective anchorage depth		$h_{ef,1}$	[mm]	---	75	75	95	---	---	---	---
			$h_{ef,2}$	[mm]	80	90	110	125	170	210	----	280
			$h_{ef,3}$	[mm]	---	150	150	190	210	---	---	---
	Diameter of clearance hole in the fixture[1)]	Only pre-positioned anchorage	$\le d_f$	[mm]	9	12	14	18	22	26	---	33
Minimum spacing and minimum edge distance			$s_{min} = c_{min}$	[mm]	40	45	55	65	85	105	120	140
Minimum thickness of concrete member			h_{min}	[mm]	$h_{ef} + 30$ (≥ 100)			$h_{ef} + 2d_0$				
Maximum torque moment			$T_{inst,max}$	[Nm]	10	20	40	60	120	150	200	300
Thickness of fixture			$t_{fix,mim}$	[mm]	0							
			$t_{fix,max}$	[mm]	3000							

1) For bigger clearance holes in the fixture see chapter 1.1 of the TR 029

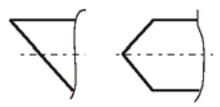
fischer threaded rods rod FIS A and RGM

Alternative point geometry threaded rods FIS A





Alternative point geometry threaded rods RGM



Marking (on random place):
Property class 8.8 or high corrosions-resistant steel C, property class 80: •
Stainless steel A4, property class 50 and high corrosion-resistant steel C, property class 50: ••

fischer Superbond	**Annex 5**
fischer threaded rods FIS A und RGM Installation parameters and dimensions	

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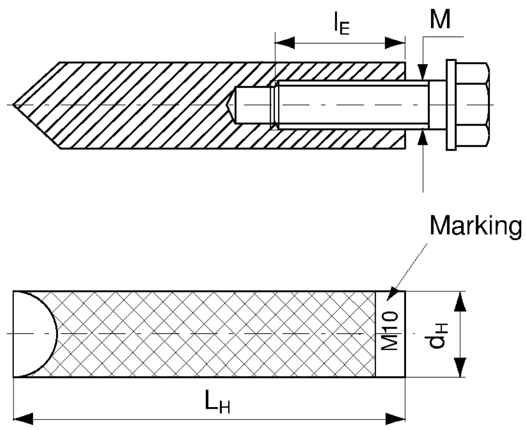
Table 3: Installation parameters for fischer internal threaded anchors RG MI

Size			**M8**	**M10**	**M12**	**M16**	**M20**
Diameter of anchor	d_H	[mm]	12	16	18	22	28
Nominal drill bit diameter	d_0	[mm]	14	18	20	24	32
Length of anchor	L_H	[mm]	90	90	125	160	200
Effective anchorage depth h_{ef} and drill hole depth h_0	$h_{ef} = h_0$	[mm]	90	90	125	160	200
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$	[mm]	55	65	75	95	125
Diameter of clearance hole in the fixture[1)]	$\leq d_f$	[mm]	9	12	14	18	22
Minimum thickness of concrete member	h_{min}	[mm]	120	125	165	205	260
Screw-in depth	$l_{E,min}$	[mm]	8	10	12	16	20
	$l_{E,max}$	[mm]	18	23	26	35	45
Maximum torque moment	$T_{inst,max}$	[Nm]	10	20	40	80	120

1) For bigger clearance holes in the fixture see chapter 1.1 of the TR 029

fischer internal threaded anchor RG MI



Marking: Anchor size
e.g.: **M10**
Stainless steel additional **A4**
e.g.: **M10 A4**
High corrosion-resistant steel additional **C**
e.g.: **M10 C**

fischer Superbond	**Annex 6**
fischer internal threaded anchors RG MI Installation parameters and dimensions	

Table 4: Allocation Resin capsule RSB to threaded rods RGM

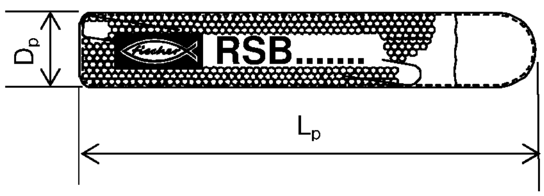
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Nominal drill bit diameter	d_0	[mm]	10	12	14	18	25	28	35
Minimum setting depth	$h_{ef,1}$	[mm]	---	75	75	95	---	---	---
Associated resin capsule RSB		[-]	---	10 mini	12 mini	16 mini	---	---	---
Medium setting depth	$h_{ef,2}$	[mm]	80	90	110	125	170	210	280
Associated resin capsule RSB		[-]	8	10	12	16	20	20 E/24	30
Maximum setting depth	$h_{ef,3}$	[mm]	---	150	150	190	210	---	---
Associated resin capsule RSB		[-]	---	2x10mini	2x12mini	2x16mini	20 E/24	---	---

Table 5: Allocation resin capsule RSB to internal threaded rods RG MI

Size			**M8**	**M10**	**M12**	**M16**	**M20**
Nominal drill bit diameter	d_0	[mm]	14	18	20	24	32
Setting depth	h_{ef}	[mm]	90	90	125	160	200
Associated resin capsule RSB		[-]	10	12	16	16 E	20 E/24

Table 6: Dimensions of resin capsule RSB

Capsule		**[-]**	**RSB 8**	**RSB 10 mini**	**RSB 10**	**RSB 12 mini**	**RSB 12**	**RSB 16 mini**	**RSB 16**	**RSB 16 E**	**RSB 20**	**RSB 20 E /24**	**RSB 30**
Diameter	D_p	[mm]	9,0	10,5		12,5		16,5			23,0		27,5
Length	L_P	[mm]	85	72	90	72	97	72	95	123	160	190	260



fischer Superbond

Resin capsule RSB
Parameters and allocations

Annex 7

Table 7: Materials: threaded rods, washers, hexagon nuts and screws

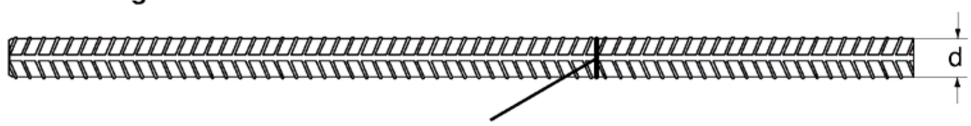
Designation	Material		
	Steel, zinc plated	**Stainless steel A4**	**High corrosion-resistant steel C**
Threaded rod	Property class 5.8 or 8.8; EN ISO 20898-1 zinc plated ≥ 5µm, EN ISO 4042 A2K or hot-dip galvanised EN ISO 10684	Property class 50, 70 or 80 EN ISO 3506 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088 or 1.4062 pr EN 10088:2011	Property class 50 or 80 EN ISO 3506 or property class 70 with f_{yk}=560 N/mm^2 1.4529; 1.4565 EN 10088
Washer EN ISO 7089	Zinc plated ≥ 5µm, EN ISO 4042 A2K or hot-dip galvanised EN ISO 10684	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088	1.4529; 1.4565 EN 10088
Hexagon nut EN 24032	Property class 5 or 8; EN ISO 20898-2 zinc plated ≥ 5µm, EN ISO 4042 A2K or hot-dip galvanised EN ISO 10684	Property class 50 oder 70 EN ISO 3506 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088	Property class 50, 70 or 80 EN ISO 3506 1.4529; 1.4565 EN 10088
Screw or threaded rod for internal threaded anchor RG MI	Property class 5.8 or 8.8; EN ISO 20898-1 zinc plated ≥ 5µm, EN ISO 4042 A2K or hot-dip galvanised EN ISO 10684	Property class 70 EN ISO 3506 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088	Property class 70 EN ISO 3506 1.4529; 1.4565 EN 10088

Table 8: Installation parameters reinforcing bars

Nominal bar size	Ø d	[mm]	**8**[1)]	**10**[1)]	**12**[1)]		**14**	**16**	**20**	**25**	**28**	**32**
Nominal drill bit diameter	d_0	[mm]	(10)12	(12)14	(14)	16	18	20	25	30	35	40
Drill hole depth	h_0	[mm]	$h_0 = h_{ef}$									
Effective anchorage depth	$h_{ef,min}$	[mm]	60	60	70		75	80	90	100	112	128
	$h_{ef,max}$	[mm]	160	200	240		280	320	400	500	560	640
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$	[mm]	40	45	55		60	65	85	110	130	160
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef} + 30$ ≥ 100			$h_{ef} + 2d_0$						

1) Both drill bit diameter can be used

Reinforcing bar



Properties of reinforcement: refer to EN 1992-1-1 Annex C, Table C.1 and C.2N

Product form		**Non-zinc-plated bars and de-coiled rod**	
Class		B	C
Characteristic yield strength f_{yk} oder $f_{0,2k}$ [MPa]		400 to 600	
Minimum value of $k = (f_t/f_{yk})$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force ε_{uk} [%]		≥ 5,0	≥ 7,5
Bentability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) [%]	Nominal bar size [mm] ≤ 8 > 8	 ± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$ (determination to EN 15630)	Nominal bar size [mm] 8 to 12 > 12	 0,040 0,056	

Rib height h:

The rib height must be $0{,}05 \bullet d \leq h \leq 0{,}07 \bullet d$

d = Nominal bar size

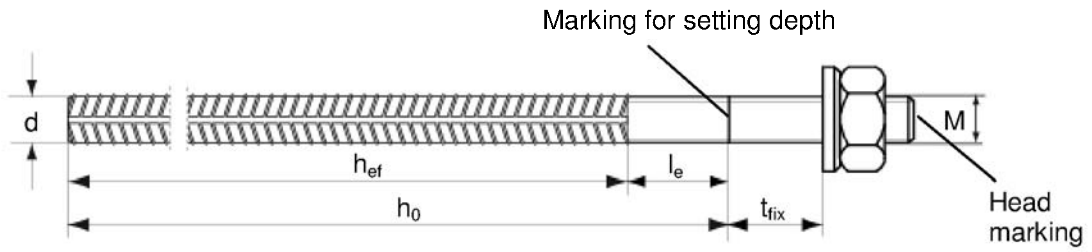
fischer Superbond	**Annex 9**
Reinforcing bars Installation parameters Materials	

Table 9: Installation parameters fischer rebar anchor FRA

Threaded diameter			**M12**[1)]		**M16**	**M20**	**M24**
Nominal bar size	d	[mm]	12		16	20	25
Nominal drill bit diameter	d_0	[mm]	(14)	16	20	25	30
Depth of drill hole ($h_0 = l_{ges}$)	h_0	[mm]	$h_{ef} + l_e$				
Effective anchorage depth	$h_{ef,min}$	[mm]	70		80	90	96
	$h_{ef,max}$	[mm]	140		220	300	380
Distance concrete surface to welded join	l_e	[mm]	100				
Minimum spacing and minimum edge distance	$s_{min}=c_{min}$	[mm]	55		65	85	105
Diameter of clearance hole in the fixture[2)]	Pre-positioned ≤ d_f	[mm]	14		18	22	26
	Push through ≤ d_f	[mm]	18		22	26	32
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef}+30$ ≥ 100	$h_{ef} + 2d_0$			
Maximum torque moment	$T_{ins,max}$	[Nm]	40		60	120	150
Thickness of the fixture	minimum t_{fix}	[mm]	0				
	maximum t_{fix}	[mm]	3000				

[1)] Both drill bit diameter can be used
[2)] For bigger clearance holes in the fixture see chapter 1.1 of the TR 029

fischer rebar anchor FRA



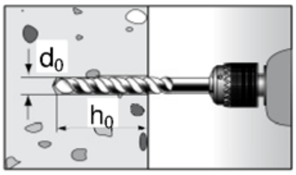
Head marking e. g.: FRA (for stainless steel);

FRA C (for high corrosion-resistant steel)

fischer Superbond	**Annex 10**
fischer rebar anchor FRA Installation parameters	

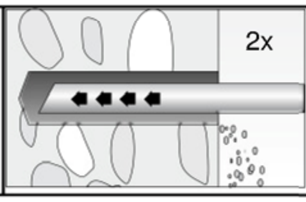
Installation with injection mortar FIS SB in hammer drilled hole

1



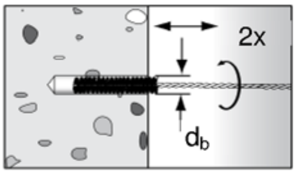
Drill the hole.
Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$
see **Tables 2, 3, 8** or **9**

2



Drill hole cleaning: Blow out the drill hole twice wit oil-free compressed air ($p \geq 6$ bar). The use of a manual blow-out pump is possible in non-cracked concrete, if at the same time the drill hole diameter is less than 18 mm and the embedment depth h_{ef} is less than 10d.

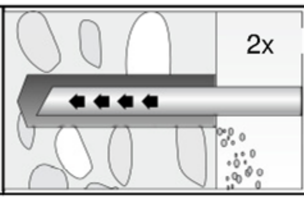
3



Brush the drill hole two times.
For deep holes use an extension.

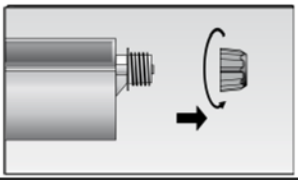
d_0 [mm]	10	12	14	16	18	20	24	25	28	30	32	35	40
d_b [mm]	11	14	16	20		25	26	27	30	40			42

4



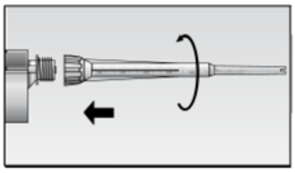
Blow out the drill hole two times, see point 2.

5



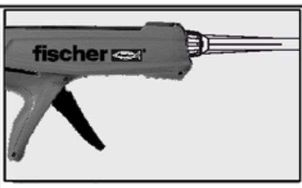
Remove Cover Cap.

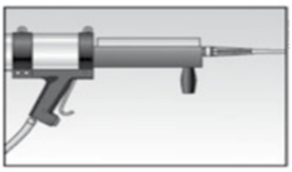
6



Twist on the static mixer (the spiral in the static mixer must be clearly visible).

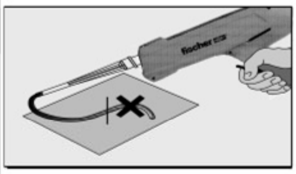
7

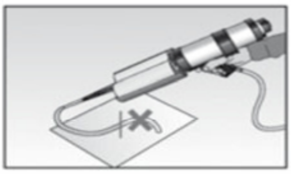




Place the cartridge into the dispenser.

8



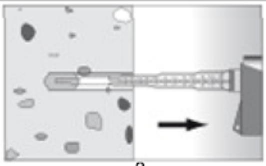


Press approx. 10 cm out of material until the resin is evenly gray in colour. Don´t use mortar that is not uniformly gray.

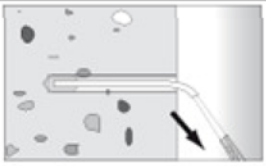
fischer Superbond	Annex 11
Hammer-drill Installation instructions injection mortar FIS SB Part 1	

Installation with injection mortar FIS SB in hammer drilled hole

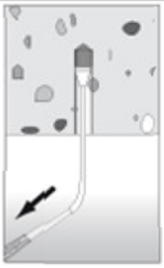
9



Fill approx. $^{2}/_{3}$ of the drill hole with mortar. Always begin from the bottom of the hole to eliminate voids.



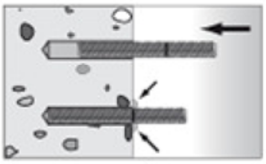
For drill hole depth ≥ 150 mm use an extension tube.

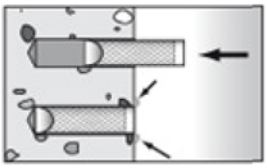


For overhead installation, or deep holes h_0 > 250 mm use an injection-adapter.

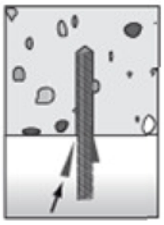
Installation fischer threaded rods FIS A and fischer internal threaded rods RG MI

10

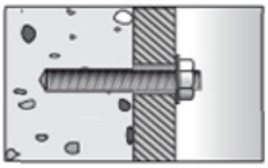




Only use clean and grease-free anchors. Mark the setting depth on the anchors. Push the anchors with twisting motions to the bottom of the resin filled holes. After insertion excess mortar must emerge from the mouth of the drill hole.



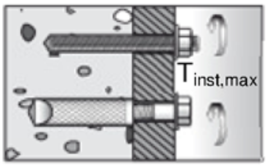
For overhead installations support the anchor rod with wedges.



For pre-installed anchors fill the annular gap with mortar.

11

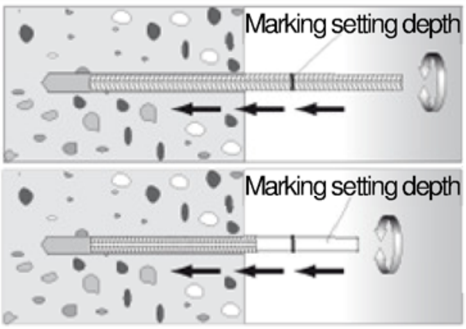
Wait for the specified curing time.
T_{cure} see **table 1.**



Mounting the fixture.
$T_{inst,max}$ see **Table 2** or **3.**

Installation reinforcing bars and fischer rebar anchors FRA

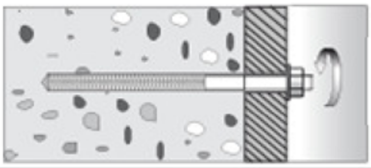
10



Only use clean and oil-free rebars. Degrease if necessary before use.
Mark the setting depth on the rebar/FRA.. Twist the rebar or FRA vigorously into the filled hole until the depth marker is reached. When reaching this mark, excess mortar must emerge from the mouth of the drill hole.

11

Wait for the specified curing time.
t_{cure} see **Table 1.**

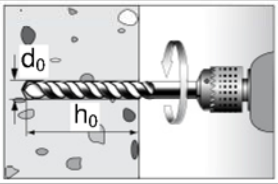


Mounting the fixture.
$T_{inst,max}$ see **Table 9.**

fischer Superbond	**Annex 12**
Hammer-drill Installation instructions injection mortar FIS SB Part 2	

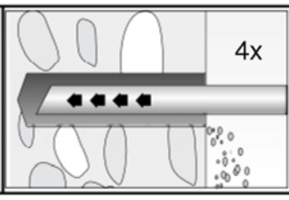
Installation with resin capsule RSB in hammer drilled hole

1



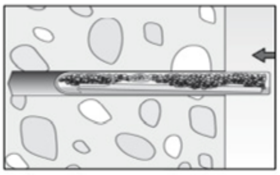
Drill the hole.
Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Table 2** or **3**.

2

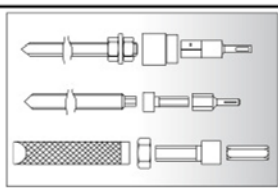


Drill hole cleaning: Blow out the drill hole four times with oil-free compressed air (p ≥ 6 bar). The use of a manual blow-out pump is possible , if at the same time the drill hole diameter is less than 18 mm and the embedment depth h_{ef} is less than 10d.

3

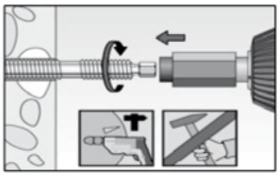


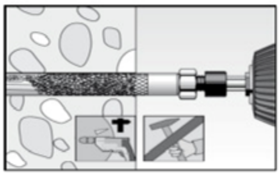
Resin capsule RSB or two RSB mini, must be pushed into the drill hole by hand.



Depending on the anchor being installed, a suitable setting tool should be used.

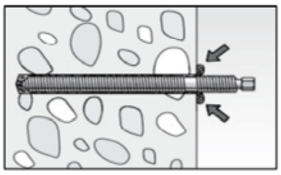
4





Only use clean and grease-free anchors.
Using a suitable adapter, drive the RG M or internally threaded RG MI into the capsule using a hammer drill set on rotary hammer action. Stop when the anchor reaches the bottom of the hole and is set to the correct embedment depth.

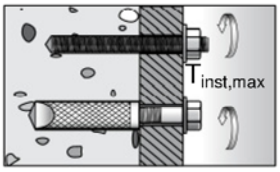
5



When fully embedded, excess mortar must emerge from the mouth of the drill hole. If not, the anchor must be pulled out directly and a second resin capsule must be pushed into the drill hole. Setting process must be repeated, step (4).

6

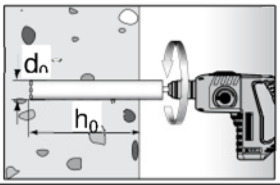
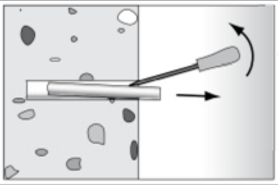
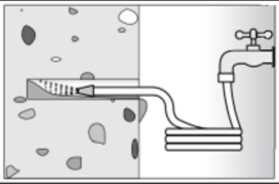
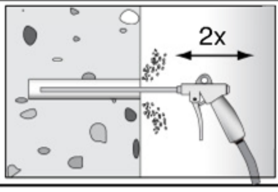
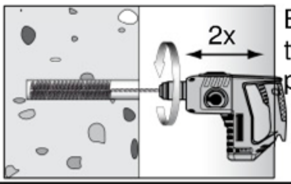
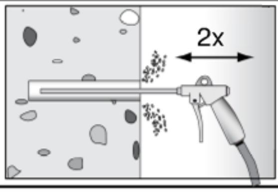
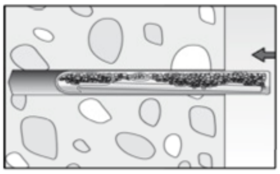
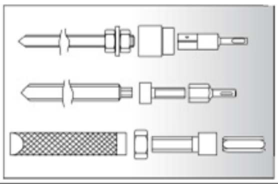
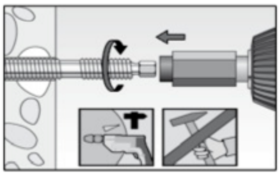
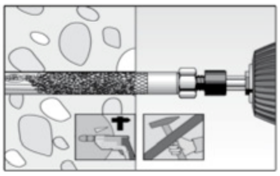
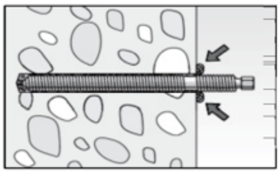
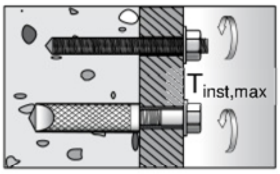
Wait for the specified curing time.
T_{cure} see **Table 1.**



Mounting the fixture
$T_{inst,max}$ see **Table 2** or **3.**

fischer Superbond	**Annex 13**
Hammer-drill Installation instructions resin capsule RSB	

Installation with resin capsule RSB in diamond drilled hole

1		Drill the hole. Drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$ see **Table 2** or **3.**		Break the drill core and remove.
2		Flush the drill hole until the water becomes clear.		
3		Blow out the drill hole two times, using oil-free compressed air (p > 6 bar).		Brush the drill hole two times using a power drill.
3		Blow out the drill hole two times, using oil-free compressed air (p > 6 bar).		
4		Resin capsule RSB or two RSB mini, must be pushed into the drill hole by hand.		Depending on the anchor being installed, use a suitable setting tool.
5			Only use clean and grease-free anchors. Using a suitable adapter, drive the RG M or internally threaded RG MI into the capsule using a hammer drill set on rotary hammer action. Stop when the anchor reaches the bottom of the hole and is set to the correct embedment depth.	
6		When reaching the correct embedment, excess mortar must emerge from the mouth of the drill hole. If not, the anchor must be pulled out directly and a second resin capsule must be pushed into the drill hole. Setting process must be repeated (5).		
7		Wait for the specified curing time. t_{cure} see **Table 1.**		Mounting the fixture $T_{inst,max}$ see **Table 2** or **3.**

fischer Superbond	Annex 14
Diamond-drill Installation instructions resin capsule RSB	

Table 10: Characteristic values to tension load of fischer threaded rods FIS A and RGM with mortar **FIS SB** or capsule **RSB** in **hammer drilled hole**

Size				M8	M10	M12	M16	M20	M24	M27[7]	M30
Steel failure											
Characteristic resistance $N_{Rk,s}$		Property class 5.8	[kN]	19	29	43	79	123	177	230	281
		Property class 8.8	[kN]	30	47	68	126	196	282	368	449
	Stainless steels A4 and steel C	Property class 50	[kN]	19	29	43	79	123	177	230	281
		Property class 70	[kN]	26	41	59	110	172	247	322	393
		Property class 80	[kN]	30	47	68	126	196	282	368	449
Partial safety factor $\gamma_{Ms,N}$[1]		Property class 5.8	[-]	1,50							
		Property class 8.8	[-]	1,50							
	Stainless steels A4 and steel C	Property class 50	[-]	2,86							
		Property class 70	[-]	1,50[2] / 1,87							
		Property class 80	[-]	1,60							
Combined pullout and concrete cone failure											
Diameter of calculation		d	[mm]	8	10	12	16	20	24	27	30
Characteristic bond resistance in non-cracked concrete C20/25											
Temperature range I[3]		$\tau_{Rk,ucr}$	[N/mm^2]	12	13	13	13	13	12	10	10
Temperature range II[3]		$\tau_{Rk,ucr}$	[N/mm^2]	12	12	12	13	13	12	10	10
Temperature range III[3]		$\tau_{Rk,ucr}$	[N/mm^2]	10	11	11	11	11	11	9	9
Temperature range IV[3]		$\tau_{Rk,ucr}$	[N/mm^2]	10	10	10	11	10	10	8	8
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I[3]		$\tau_{Rk,cr}$	[N/mm^2]	6,5	7,0	7,5	7,5	7,5	7,5	7,5	7,5
Temperature range II[3]		$\tau_{Rk,cr}$	[N/mm^2]	6,0	6,5	7,5	7,5	7,5	7,5	7,0	7,0
Temperature range III[3]		$\tau_{Rk,cr}$	[N/mm^2]	5,5	6,0	6,5	6,5	6,5	6,5	6,0	6,0
Temperature range IV[3]		$\tau_{Rk,cr}$	[N/mm^2]	5,0	5,5	6,0	6,0	6,0	6,0	5,5	5,5
Increasing factor for τ_{Rk}	Ψ_c	C25/30	[-]	1,02							
		C30/37	[-]	1,04							
		C35/45	[-]	1,07							
		C40/50	[-]	1,08							
		C45/55	[-]	1,09							
		C50/60	[-]	1,10							
Splitting failure											
Edge distance $c_{cr,sp}$ [mm]		$h / h_{ef} \geq 2,0$		$1,0\ h_{ef}$							
		$2,0 > h / h_{ef} > 1,3$		$4,6\ h_{ef} - 1,8\ h$							
		$h / h_{ef} \leq 1,3$		$2,26\ h_{ef}$							
Spacing		$s_{cr,sp}$	[mm]	$2c_{cr,sp}$							
Partial safety factor[1] $\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [-]		dry and wet		1,5[4]							
		flooded hole[6]		1,8[5]	1,5[4]						

[1] In absence of other national regulations
[2] For steel C: f_{uk} = 700 N/mm^2; f_{yk} = 560 N/mm^2
[3] See annex 4
[4] The partial safety factor γ_2 = 1.0 is included
[5] The partial safety factor γ_2 = 1,2 is included
[6] Only RSB
[7] Only FIS SB

Table 11: Characteristic values to shear load of fischer threaded rods FIS A and RGM in **hammer** and **diamond drilled hole**

Size					M8	M10	M12	M16	M20	M24	M27[4)]	M30
Steel failure without lever arm												
Characteristic resistance $V_{Rk,s}$		Property class	5.8	[kN]	9	15	21	39	61	89	115	141
			8.8	[kN]	15	23	34	63	98	141	184	225
	Stainless steels A4 and steel C	Property class	50	[kN]	9	15	21	39	61	89	115	141
			70	[kN]	13	20	30	55	86	124	161	197
			80	[kN]	15	23	34	63	98	141	184	225
Steel failure with lever arm												
Characteristic bending moment $M^0_{Rk,s}$		Property class	5.8	[Nm]	19	37	65	166	324	560	833	1123
			8.8	[Nm]	30	60	105	266	519	896	1333	1797
	Stainless steels A4 and steel C	Property class	50	[Nm]	19	37	65	166	324	560	833	1123
			70	[Nm]	26	52	92	232	454	784	1167	1573
			80	[Nm]	30	60	105	266	519	896	1333	1797
Partial safety factor												
$\gamma_{Ms,V}$ [1)]		Property class	5.8	[-]	1,25							
			8.8	[-]	1,25							
	Stainless steels A4 and steel C	Property class	50	[-]	2,38							
			70	[-]	1,25[2)] / 1,56							
			80	[-]	1,33							
Concrete pryout failure												
Factor k in equation (5.7) of Technical Report TR 029, Section 5.2.3.3			k	[-]	2,00							
Partial safety factor			γ_{Mcp} [1)]	[-]	1,5[3)]							
Concrete edge failure					See Technical Report TR 029, Section 5.2.3.4							
Partial safety factor			γ_{Mc} [1)]	[-]	1,5[3)]							

[1)] In absence of other national regulations.

[2)] For steel C: f_{uk} = 700 N/mm^2 ; f_{yk} = 560 N/mm^2

[3)] The partial safety factor γ_2 = 1,0 is included.

[4)] Only FIS SB

Table 12: Displacements to tension load

Size		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked and cracked concrete; temperature range I, II, III, IV									
Displacement	δ_{N0} [mm/(N/mm^2)]	0,07	0,08	0,09	0,10	0,11	0,12	0,13	0,13
Displacement	$\delta_{N\infty}$ [mm/(N/mm^2)]	0,13	0,14	0,15	0,17	0,17	0,18	0,19	0,19

Calculation of characteristic displacement with $\delta_N = (\delta_{N0} \bullet \tau_{Sd}) / 1,4$

Table 13: Displacements to shear load

Size		M8	M10	M12	M16	M20	M24	M27	M30
Displacement	δ_{V0} [mm/kN]	0,18	0,15	0,12	0,09	0,07	0,06	0,05	0,05
Displacement	$\delta_{V\infty}$ [mm/kN]	0,27	0,22	0,18	0,14	0,11	0,09	0,08	0,07

Calculation of characteristic displacement with $\delta_V = (\delta_{V0} \bullet V_{Sd}) / 1,4$

fischer Superbond	**Annex 16**
Hammer and diamond-drill fischer threaded rods FIS A and RGM Characteristic values to shear load and displacements	

Table 14: Characteristic values to tension load of fischer internal threaded anchors RG MI with mortar **FIS SB** or capsule **RSB** in **hammer drilled hole**

Size					M 8	M 10	M 12	M 16	M 20
Steel failure									
Characteristic resistance with screw	$N_{Rk,s}$	Property class	5.8	[kN]	19	29	43	79	123
			8.8	[kN]	29	47	68	108	179
		Property class 70	A4	[kN]	26	41	59	110	172
			C	[kN]	26	41	59	110	172
Partial safety factor	$\gamma_{Ms,N}$ [1)]	Property class	5.8	[-]	1,50				
			8.8	[-]	1,50				
		Property class 70	A4	[-]	1,87				
			C	[-]	1,87				
Combined pullout and concrete cone failure									
Diameter of calculation	d_H			[mm]	12	16	18	22	28
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I[2)] (40°C/24°C)	$\tau_{Rk,ucr}$			[N/mm²]	12	12	11	11	9,5
Temperature range II[2)] (80°C/50°C)	$\tau_{Rk,ucr}$			[N/mm²]	12	11	11	10	9,0
Temperature range III[2)] (120°C/72°C)	$\tau_{Rk,ucr}$			[N/mm²]	11	10	10	9	8
Temperature range IV[2)] (150°C/90°C)	$\tau_{Rk,ucr}$			[N/mm²]	10	9,5	9	8,5	7,5
Characteristic values in cracked concrete C20/25									
Temperature range I[2)] (40°C/24°C)	$\tau_{Rk,cr}$			[N/mm²]	5,0				
Temperature range II[2)] (80°C/50°C)	$\tau_{Rk,cr}$			[N/mm²]	5,0				
Temperature range III[2)] (120°C/72°C)	$\tau_{Rk,cr}$			[N/mm²]	4,5				
Temperature range IV[2)] (150°C/90°C)	$\tau_{Rk,cr}$			[N/mm²]	4,0				
Increasing factors for τ_{Rk}	Ψ_c		C25/30	[-]	1,02				
			C30/37	[-]	1,04				
			C35/45	[-]	1,07				
			C40/50	[-]	1,08				
			C45/55	[-]	1,09				
			C50/60	[-]	1,10				
Splitting failure									
Edge distance	$c_{cr,sp}$ [mm]		$h / h_{ef} \geq 2,0$		$1,0\ h_{ef}$				
			$2,0 > h / h_{ef} > 1,3$		$4,6\ h_{ef} - 1,8\ h$				
			$h / h_{ef} \leq 1,3$		$2,26\ h_{ef}$				
Spacing	$s_{cr,sp}$			[mm]	$2c_{cr,sp}$				
Partial safety factor[1)] $\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [-]			dry and wet		1,5[3)]				
			flooded hole[5)]		1,8[4)]	1,5[3)]			

[1)] In absence of other national regulations.
[2)] See annex 4.
[3)] The partial safety factor $\gamma_2 = 1,0$ is included.
[4)] The partial safety factor $\gamma_2 = 1,2$ is included.
[5)] Only RSB

Table 15: Characteristic values to shear load of fischer internal threaded anchors RG MI in **hammer** and **diamond drilled hole**

Size					**M 8**	**M 10**	**M 12**	**M 16**	**M 20**
Steel failure without lever arm									
Characteristic resistance	$V_{Rk,s}$	Property class	5.8	[kN]	9,2	14,5	21,1	39,2	69
			8.8	[kN]	14,6	23,2	33,7	54,0	90
		Property class 70	A4	[kN]	12,8	20,3	29,5	54,8	86
			C	[kN]	12,8	20,3	29,5	54,8	86
Partial safety factor	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25				
			8.8	[-]	1,25				
		Property class 70	A4	[-]	1,56				
			C	[-]	1,56				
Steel failure with lever arm									
Characteristic bending moment	$M^0_{Rk,s}$	Property class	5.8	[Nm]	20	39	68	173	337
			8.8	[Nm]	30	60	105	266	519
		Property class 70	A4	[Nm]	26	52	92	232	454
			C	[Nm]	26	52	92	232	454
Partial safety factor	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25				
			8.8	[-]	1,25				
		Property class 70	A4	[-]	1,56				
			C	[-]	1,56				
Concrete pryout failure									
Factor k in equation (5.7) of Technical Report TR 029, Section 5.2.3.3				[-]	2,0				
Partial safety factor	γ_{Mcp} [1)]			[-]	1,5[2)]				
Concrete edge failure					See Technical Report TR 029, Section 5.2.3.4				
Partial safety factor	γ_{Mc} [1)]			[-]	1,5[2)]				

1) In absence of other national regulations.
2) The partial safety factor $\gamma_2 = 1{,}0$ is included.

Table 16: Displacements to tension load

Size		**M 8**	**M 10**	**M 12**	**M 16**	**M 20**
Non-cracked concrete and cracked concrete; temperature range I, II, III, IV						
Displacement	δ_{N0} [mm/(N/mm²)]	0,09	0,10	0,10	0,11	0,19
Displacement	$\delta_{N\infty}$ [mm/(N/mm²)]	0,13	0,15	0,15	0,17	0,19

Calculation of characteristic displacement with $\delta_N = (\delta_{N0} \bullet \tau_{Sd}) / 1{,}4$

Table 17: Displacements to shear load

Size		**M 8**	**M 10**	**M 12**	**M 16**	**M 20**
Displacement	δ_{V0} [mm/kN]	0,12	0,09	0,08	0,07	0,05
Displacement	$\delta_{V\infty}$ [mm/kN]	0,18	0,14	0,12	0,10	0,08

Calculation of characteristic displacement $\delta_V = (\delta_{V0} \bullet V_{Sd}) / 1{,}4$

fischer Superbond	**Annex 18**
Hammer and diamond-drill fischer internal threaded anchor RG MI Characteristic values to shear load and displacements	

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Table 18: Characteristic values to tension load of fischer threaded rods RGM with **capsule RSB** in **diamond drilled hole**

Size			**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M 24**	**M 30**
Steel failure			Characteristic resistance for steel failure see table 10						
Combined pullout and concrete cone failure									
Diameter of calculation	d	[mm]	8	10	12	16	20	24	30
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I[1] (40°C/24°C)	$\tau_{Rk,ucr}$	[N/mm²]	13	13	14	14	14	13	11
Temperature range II[1] (80°C/50°C)	$\tau_{Rk,ucr}$	[N/mm²]	12	13	13	14	13	13	10
Temperature range III[1] (120°C/72°C)	$\tau_{Rk,ucr}$	[N/mm²]	11	12	12	12	12	11	9,5
Temperature range IV[1] (150°C/90°C)	$\tau_{Rk,ucr}$	[N/mm²]	10	11	11	11	11	10	8,5
Characteristic bond resistance in cracked concrete C20/25									
Temperature range I[1] (40°C/24°C)	$\tau_{Rk,cr}$	[N/mm²]	---	---	---	7,5	7,5	7,5	7,5
Temperature range II[1] (80°C/50°C)	$\tau_{Rk,cr}$	[N/mm²]	---	---	---	7,5	7,5	7,5	7,0
Temperature range III[1] (120°C/72°C)	$\tau_{Rk,cr}$	[N/mm²]	---	---	---	6,5	6,5	6,5	6,5
Temperature range IV[1] (150°C/90°C)	$\tau_{Rk,cr}$	[N/mm²]	---	---	---	6,0	6,0	6,0	6,0
Increasing factors for τ_{Rk}	Ψ_c	C25/30 [-]	1,02						
		C30/37 [-]	1,04						
		C35/45 [-]	1,07						
		C40/50 [-]	1,08						
		C45/55 [-]	1,09						
		C50/60 [-]	1,10						
Splitting failure									
Edge distance $c_{cr,sp}$ [mm]		$h / h_{ef} \geq 2,0$	$1,0\ h_{ef}$						
		$2,0 > h / h_{ef} > 1,3$	$4,6\ h_{ef} - 1,8\ h$						
		$h / h_{ef} \leq 1,3$	$2,26\ h_{ef}$						
Spacing		$s_{cr,sp}$ [mm]	$2c_{cr,sp}$						
Partial safety factor[2] $\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [-]		dry and wet	1,5[3]						
		flooded hole	1,8[4]	1,5[3]					

[1] See Annex 4.
[2] In absence of other national regulations.
[3] The partial safety factor $\gamma_2 = 1,0$ is included.
[4] The partial safety factor $\gamma_2 = 1,2$ is included.

fischer Superbond	**Annex 19**
Diamond-drill Characteristic values to tension load of fischer threaded rods RGM	

Table 19: Characteristic values to tension load of fischer internal threaded anchors RG MI with **capsule RSB** in **diamond drilled hole**

Size			**M 8**	**M 10**	**M 12**	**M 16**	**M 20**
Steel failure			Characteristic resistance for steel failure see table 14				
Combined pullout and concrete cone failure							
Diameter of calculation	d	[mm]	12	16	18	22	28
Characteristic bond resistance in non-cracked concrete C20/25							
Temperature range I[1)] (40°C/24°C)	$\tau_{Rk,ucr}$	[N/mm²]	13	12	12	11	10
Temperature range II[1)] (80°C/50°C)	$\tau_{Rk,ucr}$	[N/mm²]	13	12	12	11	9,5
Temperature range III[1)] (120°C/72°C)	$\tau_{Rk,ucr}$	[N/mm²]	11	11	10	9,5	8,5
Temperature range IV[1)] (150°C/90°C)	$\tau_{Rk,ucr}$	[N/mm²]	10	10	9,5	9,0	8,0
Characteristic bond resistance in cracked concrete C20/25							
Temperature range I[1)] (40°C/24°C)	$\tau_{Rk,cr}$	[N/mm²]	---	5,0	5,0	5,0	5,0
Temperature range II[1)] (80°C/50°C)	$\tau_{Rk,cr}$	[N/mm²]	---	5,0	5,0	5,0	5,0
Temperature range III[1)] (120°C/72°C)	$\tau_{Rk,cr}$	[N/mm²]	---	4,5	4,5	4,5	4,5
Temperature range IV[1)] (150°C/90°C)	$\tau_{Rk,cr}$	[N/mm²]	---	4,0	4,0	4,0	4,0
Increasing factors for τ_{Rk}	Ψ_c	C25/30 [-]	1,02				
		C30/37 [-]	1,04				
		C35/45 [-]	1,07				
		C40/50 [-]	1,08				
		C45/55 [-]	1,09				
		C50/60 [-]	1,10				
Splitting failure							
Edge distance	$c_{cr,sp}$ [mm]	$h / h_{ef} \geq 2,0$	$1,0\ h_{ef}$				
		$2,0 > h / h_{ef} > 1,3$	$4,6\ h_{ef} - 1,8\ h$				
		$h / h_{ef} \leq 1,3$	$2,26\ h_{ef}$				
Spacing	$s_{cr,sp}$	[mm]	$2c_{cr,sp}$				
Partial safety factor[2)] $\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [-]		dry and wet	1,5[3)]				
		flooded hole	1,8[4)]	1,5[3)]			

[1)] See Annex 4.
[2)] In absence of other national regulations.
[3)] The partial safety factor $\gamma_2 = 1,0$ is included.
[4)] The partial safety factor $\gamma_2 = 1,2$ is included.

fischer Superbond

Diamond-drill
Characteristic values to tension load of internal threaded rods RG MI

Annex 20

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Table 20: Characteristic values to tension load of reinforcing bars with mortar **FIS SB** in **hammer drilled hole**

Size		**Ø d**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Steel failure											
Characteristic resistance reinforcing bars[4]	$N_{Rk,s}$	[kN]	28	44	63	85	111	173	270	339	443
Partial safety factor	$\gamma_{Ms,N}$[1]	[-]	1,4								
Combined pullout and concrete cone failure											
Diameter for calculation	d	[mm]	8	10	12	14	16	20	25	28	32
Characteristic bond resistance in non-cracked concrete C20/25											
Temperature range I[3] (40°C / 24°C)	$\tau_{Rk,ucr}$	[N/mm²]	8,0	8,5	9,0	9,5	9,5	10	9,5	9,0	7,5
Temperature range II[3] (80°C / 50°C)	$\tau_{Rk,ucr}$	[N/mm²]	8,0	8,5	9,0	9,0	9,5	9,5	9,0	8,5	7,5
Temperature range III[3] (120°C / 72°C)	$\tau_{Rk,ucr}$	[N/mm²]	7,0	7,5	8,0	8,0	8,5	8,5	8,0	7,5	6,5
Temperature range IV[3] (150°C / 90°C)	$\tau_{Rk,ucr}$	[N/mm²]	6,5	7,0	7,0	7,5	7,5	8,0	7,5	7,0	6,0
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I[3] (40°C / 24°C)	$\tau_{Rk,cr}$	[N/mm²]	4,5	6,0	6,0	6,0	7,0	6,0	6,0	6,0	6,0
Temperature range II[3] (80°C / 50°C)	$\tau_{Rk,cr}$	[N/mm²]	4,5	5,5	5,5	5,5	6,5	6,0	6,0	6,0	6,0
Temperature range III[3] (120°C / 72°C)	$\tau_{Rk,cr}$	[N/mm²]	4,0	5,0	5,0	5,0	6,0	5,5	5,5	5,5	5,5
Temperature range IV[3] (150°C / 90°C)	$\tau_{Rk,cr}$	[N/mm²]	3,5	4,5	4,5	4,5	5,5	5,0	5,0	5,0	5,0
Increasing factors for τ_{Rk}	Ψ_c	C25/30 [-]	1,02								
		C30/37 [-]	1,04								
		C35/45 [-]	1,07								
		C40/50 [-]	1,08								
		C45/55 [-]	1,09								
		C50/60 [-]	1,10								
Splitting failure											
Edge distance $c_{cr,sp}$ [mm]		$h / h_{ef} \geq 2,0$	$1,0\ h_{ef}$								
		$2,0 > h / h_{ef} > 1,3$	$4,6\ h_{ef} - 1,8\ h$								
		$h / h_{ef} \leq 1,3$	$2,26\ h_{ef}$								
Spacing	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$								
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$[1]	[-]	1,5[2]								

[1] In absence of other national regulations.
[2] The partial safety factor $\gamma_2 = 1,0$ is included.
[3] See annex 4.
[4] The values given obtain for reinforcing bars B500B with $f_{uk} = 550$ N/mm² and $f_{yk} = 500$ N/mm²
Other reinforcing bars have to be calculated according to TR 029, Equation (5.1).

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Hammer drill
Characteristic values to tension load of reinforcing bars

Annex 21

Table 21: Characteristic values to shear load of reinforcing bars with mortar **FIS SB** in **hammer drilled hole**

Size			**∅ d**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Steel failure without lever arm												
Characteristic resistance[1)]		$V_{Rk,s}$	[kN]	13,8	21,6	31,1	42,4	55,3	87	135	170	221
Partial safety factor		$\gamma_{Ms,V}$	[-]	1,5								
Steel failure with lever arm												
Characteristic bending moment[1)]		$M^0_{Rk,s}$	[Nm]	33	65	112	178	265	518	1012	1422	2123
Partial safety factor		$\gamma_{Ms,V}$	[-]	1,5								
Concrete pryout failure												
Factor k in equation (5.7) of Technical Report TR 029, Section 5.2.3.3			[-]	2,0								
Partial safety factor		γ_{Mcp}[2)]	[-]	1,5[3)]								
Concrete edge failure				See Technical Report TR 029, Section 5.2.3.4								
Partial safety factor		γ_{Mc}[2)]	[-]	1,5[3)]								

[1)] The values given obtain for reinforcing bars B500B with f_{uk} = 550 N/mm^2 and f_{yk} = 500 N/mm^2
Other reinforcing bars have to be calculated according to TR 029, Equation (5.1).
[2)] In absence of other national regulations.
[3)] The partial safety factor γ_2 = 1,0 is included.

Table 22: Displacements of reinforcing bars to tension load

Size			**∅ d**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Non-cracked and non-cracked concrete; temperature range I, II, III, IV												
Displacement	δ_{N0}		[mm/(N/mm^2)]	0,07	0,08	0,09	0,09	0,10	0,11	0,12	0,13	0,13
Displacement	$\delta_{N\infty}$		[mm/(N/mm^2)]	0,12	0,13	0,13	0,15	0,16	0,16	0,18	0,20	0,20

Calculation of characteristic displacement with $\delta_N = (\delta_{N0} \bullet \tau_{Sd}) / 1{,}4$

Table 23: Displacements of reinforcing bars to shear load

Size			**∅ d**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Displacement	δ_{V0}		[mm/kN]	0,18	0,15	0,12	0,10	0,09	0,07	0,06	0,05	0,05
Displacement	$\delta_{V\infty}$		[mm/kN]	0,27	0,22	0,18	0,16	0,14	0,11	0,09	0,08	0,06

Calculation of characteristic displacement with $\delta_V = (\delta_{V0} \bullet V_{Sd}) / 1{,}4$

fischer Superbond	**Annex 22**
Hammer-drill Characteristic values to shear load and displacements of reinforcing bars	

Table 24: Characteristic values to tension load of fischer rebar anchors FRA with mortar **FIS SB** in **hammer drilled hole**

Size		M12	M16	M20	M24
Steel failure					
Characteristic resistance	$N_{Rk,s}$ [kN]	63	111	173	270
Partial safety factor	$\gamma_{Ms,N}$ [1] [-]	1,4			
Combined pullout and concrete cone failure					
Diameter of calculation	d [mm]	12	16	20	25
Characteristic bond resistance in non-cracked concrete C20/25					
Temperature range I[3] (40°C / 24°C)	$\tau_{Rk,ucr}$ [N/mm²]	9,0	9,5	10	9,5
Temperature range II[3] (80°C / 50°C)	$\tau_{Rk,ucr}$ [N/mm²]	9,0	9,5	9,5	9,0
Temperature range III[3] (120°C / 72°C)	$\tau_{Rk,ucr}$ [N/mm²]	8,0	8,5	8,5	8,0
Temperature range IV[3] (150°C / 90°C)	$\tau_{Rk,ucr}$ [N/mm²]	7,0	7,5	8,0	7,5
Characteristic bond resistance in cracked concrete C20/25					
Temperature range I[3] (40°C / 24°C)	$\tau_{Rk,cr}$ [N/mm²]	6,0	7,0	6,0	6,0
Temperature range II[3] (80°C / 50°C)	$\tau_{Rk,cr}$ [N/mm²]	5,5	6,5	6,0	6,0
Temperature range III[3] (120°C / 72°C)	$\tau_{Rk,cr}$ [N/mm²]	5,0	6,0	5,5	5,5
Temperature range IV[3] (150°C / 90°C)	$\tau_{Rk,cr}$ [N/mm²]	4,5	5,5	5,0	5,0
Increasing factors for τ_{Rk} Ψ_c	C25/30 [-]	1,02			
	C30/37 [-]	1,04			
	C35/45 [-]	1,07			
	C40/50 [-]	1,08			
	C45/55 [-]	1,09			
	C50/60 [-]	1,10			
Splitting failure					
Edge distance $c_{cr,sp}$ [mm]	$h / h_{ef} \geq 2,0$	$1,0\ h_{ef}$			
	$2,0 > h / h_{ef} > 1,3$	$4,6\ h_{ef} - 1,8\ h$			
	$h / h_{ef} \leq 1,3$	$2,26\ h_{ef}$			
Spacing	$s_{cr,sp}$ [mm]	$2\ c_{cr,sp}$			
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1] [-]	1,5[2]			

[1] In absence of other national regulations.
[2] The partial safety factor $\gamma_2 = 1,0$ is included.
[3] See annex 4.

fischer Superbond

Hammer-drill
Characteristic values to tension load of fischer rebar anchors FRA

Annex 23

Table 25: Characteristic values to shear load of fischer rebar anchors FRA with mortar **FIS SB** in **hammer drilled hole**

Size			**M12**	**M16**	**M20**	**M24**
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}$	[kN]	30	55	86	124
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,56			
Steel failure with lever arm						
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	92	233	454	785
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,56			
Concrete pryout failure						
Factor k in equation (5.7) of Technical Report TR 029, Section 5.2.3.3	k	[-]	2,0			
Partial safety factor	γ_{Mcp} [1)]	[-]	1,5[2)]			
Concrete edge failure			See Technical Report TR 029, Section 5.2.3.4			
Partial safety factor	γ_{Mc} [1)]	[-]	1,5[2)]			

[1)] In absence of other national regulations.
[2)] The partial safety factor γ_2 = 1,0 is included.

Table 26: Displacements of fischer rebar anchors FRA to tension load

Size		∅	**12**	**16**	**20**	**24**
Non-cracked and non-cracked concrete; temperature range I, II, III, IV						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,09	0,10	0,11	0,12
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,13	0,16	0,16	0,18

Calculation of characteristic displacement with $\delta_N = (\delta_{N0} \bullet \tau_{Sd}) / 1,4$

Table 27: Displacements of fischer rebar anchors FRA to shear load

Size		∅	**12**	**16**	**20**	**24**
Displacement	δ_{V0}	[mm/kN]	0,12	0,09	0,07	0,06
Displacement	$\delta_{V\infty}$	[mm/kN]	0,18	0,14	0,11	0,09

Calculation of characteristic displacement with $\delta_V = (\delta_{V0} \bullet V_{Sd}) / 1,4$

fischer Superbond	**Annex 24**
Hammer-drill Characteristic values to shear load and displacements of fischer rebar anchors FRA	

Deutsches Institut für Bautechnik DIBt

Seismic design according TR045 "Design of metal anchors under seismic action"

The recommended seismic performance categories are given in Table 28. The value of a_g or that of the product $a_g \cdot S$ used in a Member State to define thresholds for the seismicity classes may be found in its National Annex of EN 1998-1:2004 and may be different to the values given in Table 28. Furthermore, the assignment of the seismic performance categories C1 and C2 to the seismicity level and building importance classes is in the responsibility of each individual Member State.

Table 28: Recommended seismic performance categories for anchors

Seismicity level[1]		**Importance Class acc. to EN 1998-1:2004,4.2.5**			
Class	$a_g \cdot S$[3]	**I**	**II**	**III**	**IV**
Very low[2]	$a_g \cdot S \leq 0{,}05$ g	No additional requirement			
Low[2]	$0{,}05$ g $< a_g \cdot S \leq 0{,}1$ g	C1	C1[4] or C2[5]		C2
> low	$a_g \cdot S > 0{,}1$ g	C1	C2		

[1] The values defining the seismicity levels are may be found in the National Annex of EN 1988-1:2004.
[2] Definition according to EN 1998-1:2004, 3.2.1.
[3] a_g = design ground acceleration on Type A ground (EN 1998-1:2004, 3.2.1).
[4] C1 for fixing non-structural elements to structures
[5] C2 for fixing structural elements to structures

The seismic design resistance $R_{d,seis}$ of a fastening shall be determined as follows:

$$R_{d,seis} = R_{k,seis} / \gamma_{M,seis}$$

The characteristic seismic design resistance $R_{k,seis}$ of a fastening shall be determined as follows:

$$R_{k,seis} = \alpha_{gap} \times \alpha_{seis} \times R^0_{k,seis}$$

The basic characteristic seismic resistance $R^0_{k,seis}$ for "steel failure", "combined pull-out and concrete cone failure" under tension load and "steel failure" under shear load shall be taken from table 31. For all other failure modes $R^0_{k,seis}$ shall be determined as for static and quasi-static action according to tables 10, 11, 20 and 21.
The reduction factors α_{seis} and α_{gap} are given in table 29.

Table 29: Reduction factors α_{seis} and α_{gap}

Loading	**Failure mode**	α_{seis}		α_{gap}	
		Single fastener	**Fastener group**	**Connections with hole clearance**[1]	**Connections without hole clearance**
Tension	Steel failure	1,0	1,0	1,00	1,00
	Combined pull-out and concrete failure	1,0	0,85		
	Concrete cone failur	0,85	0,75		
	Splitting failure	1,0	0,85		
Shear	Steel failure	1,0	0,85	0,50	
	Concrete edge failure	1,0	0,85		
	Concrete pry-out failure	0,85	0,75		

[1] Connections with hole clearance according to CEN/TS 1992-4-4: 2009, Table 1

fischer Superbond	**Annex 25**
Recommended performance categories and reduction factors for loads under seismic action	

Table 30A: Characteristic values for seismic action valid for performance category C1 of fischer threaded rods FIS A and RGM with mortar **FIS SB** or capsule **RSB** in **hammer drilled hole**

Seize				M8	M10	M12	M16	M20	M24	M27	M30
Characteristic resistance tension load, steel failure											
$N_{Rk,s,seis}$ [kN]		Property class	5.8	19	29	43	79	123	177	230	281
			8.8	30	47	68	126	196	282	368	449
	Stainless steel A4 and steel C	Property class	50	19	29	43	79	123	177	230	281
			70	26	41	59	110	172	247	322	393
			80	30	47	68	126	196	282	368	449
$\gamma_{M,s,seis}$ 1) [-]		Property class	5.8	1,50							
			8.8	1,50							
	Stainless steel A4 and steel C	Property class	50	2,86							
			70	1,50 2) / 1,87							
			80	1,6							
Characteristic bond resistance, combined pullout and concrete cone failure											
Temperature range I 3)	$\tau_{Rk,seis}$		[N/mm²]	4,6	5,0	5,6	5,6	5,6	5,6	5,6	6,4
Temperature range II 3)	$\tau_{Rk,seis}$		[N/mm²]	4,3	4,6	5,6	5,6	5,6	5,6	5,3	6,0
Temperature range III 3)	$\tau_{Rk,seis}$		[N/mm²]	3,9	4,3	4,9	4,9	4,9	4,9	4,5	5,1
Temperature range IV 3)	$\tau_{Rk,seis}$		[N/mm²]	3,6	3,9	4,5	4,5	4,5	4,5	4,1	4,7
$\gamma_{M,p,seis}$ 1)			dry and wet	1,5 4)							
			flooded hole 6)	1,8 5)		1,5 4)					
Characteristic resistance shear load, steel failure without lever arm											
$V_{Rk,s,seis}$ 7) [kN]		Property class	5.8	9	15	21	39	61	89	115	141
			8.8	15	23	34	63	98	141	184	225
	Stainless steel A4 and steel C	Property class	50	9	15	21	39	61	89	115	141
			70	13	20	30	55	86	124	161	197
			80	15	23	34	63	98	141	184	225
$\gamma_{M,s,seis}$ 1) [-]		Property class	5.8	1,25							
			8.8	1,25							
	Stainless steel A4 and steel C	Property class	50	2,38							
			70	1,25 2) / 1,56							
			80	1,33							

1) In absence of other national regulations
3) See annex 4.
5) The partial safety factor γ_2 = 1,2 is included
7) For fischer treaded rods FIS A / RGM the factor for steel ductility is 1,0

2) For steel C with f_{yk} = 560 N/mm²
4) The partial safety factor γ_2 = 1,0 is included
6) Only RSB

fischer Superbond	Annex 26
Hammer-drill Characteristic values for loads under seismic action categories C1 fischer threaded rods FIS A und RGM	

Table 30B: Characteristic values for seismic action valid for performance category C1 of standard threaded rods with mortar **FIS SB** in **hammer drilled hole**

Seize				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Characteristic resistance tension load											
Steel failure				See Table 30A							
Characteristic bond resistance, combined pullout and concrete cone failure				See Table 30A							
Characteristic resistance shear load, steel failure without lever arm											
$V_{Rk,s,seis}$ [kN]		Property class	5.8	6	11	15	27	43	62	81	99
			8.8	11	16	24	44	69	99	129	158
	Stainless steel A4 and steel C	Property class	50	6	11	15	27	43	62	81	99
			70	9	14	21	39	60	87	113	138
			80	11	16	24	44	69	99	129	158
$\gamma_{M,s,seis}$ 1) [-]		Property class	5.8	1,25							
			8.8	1,25							
	Stainless steel A4 and steel C	Property class	50	2,38							
			70	1,56							
			80	1,33							

1) In absence of other national regulations

Table 30C: Characteristic values for seismic action valid for performance category C1 of reinforcing bars with mortar **FIS SB** in **hammer drilled hole**

Rebar B500B		**size**	**8**	**10**	**12**	**14**	**16**	**20**	**25**	**28**	**32**
Characteristic resistance tension load, steel failure											
$N_{Rk,s,seis}$		[kN]	28	44	63	85	111	173	270	339	443
$\gamma_{M,s,seis}$ 1)		[-]	1,4								
Characteristic bond resistance, combined pullout and concrete cone failure											
Temperature range I 3)	$\tau_{Rk,seis}$	[N/mm²]	3,2	4,3	4,5	4,5	5,3	4,5	4,5	4,5	5,1
Temperature range II 3)	$\tau_{Rk,seis}$	[N/mm²]	3,2	3,9	4,1	4,1	4,9	4,5	4,5	4,5	5,1
Temperature range III 3)	$\tau_{Rk,seis}$	[N/mm²]	2,8	3,6	3,8	3,8	4,5	4,1	4,1	4,1	4,7
Temperature range IV 3)	$\tau_{Rk,seis}$	[N/mm²]	2,5	3,2	3,4	3,4	4,1	3,8	3,8	3,8	4,3
$\gamma_{M,p,seis}$ 1)		[-]	1,5 2)								
Characteristic resistance shear load, steel failure without lever arm											
$V_{Rk,s,seis}$ 5)		[kN]	9,7	15,1	21,8	29,7	38,7	60,9	94,5	119,0	154,7
$\gamma_{M,s,seis}$ 1)		[-]	1,5 2)								

1) In absence of other national regulations
2) The partial safety factor γ_2 = 1,0 is included
3) See annex 4.

fischer Superbond	**Annex 27**
Hammer-drill Characteristic values for loads under seismic action categories C1 Standard threaded rods, reinforcing bars	